The Standalone Traffic Information Service (TIS) Server

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Objective

- Developed a standalone TIS Server that is 100% MOPS compliant
- Modular architecture is a viable solution to provide TIS
- TIS Server is comparable to the current TIS deployed in the NAS

Topics

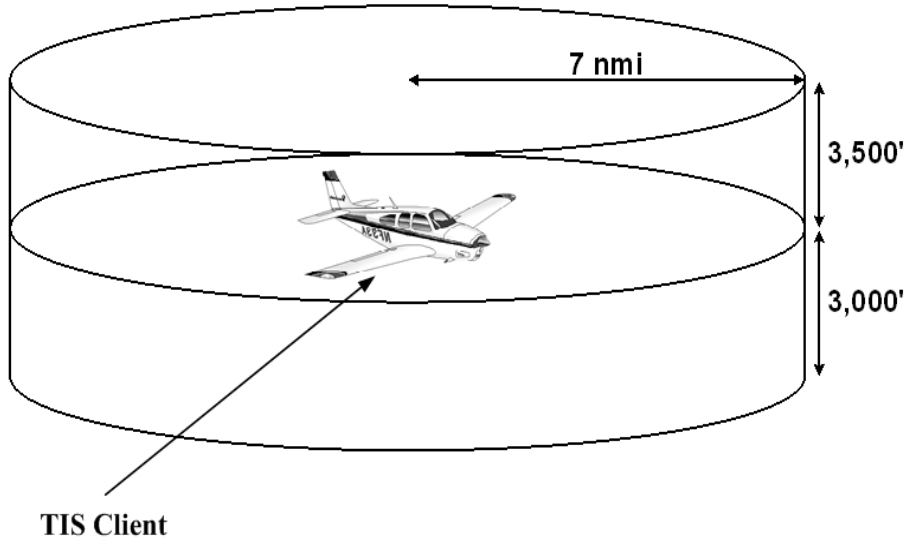
- Project Motivation
- Traffic Information Service = TIS
- TIS Server concept and design
- Testing and evaluation
- Comparing the TIS Server to the current ASR-9 TIS

Project Motivation

- Over 25 TIS capable radars are being displaced by radars without TIS
  - ASR-8's w/ Mode S → ASR-11's
- TIS is gaining popularity among GA community
  - Introduction of low cost avionics suites by Garmin & Honeywell
- Develop a low cost, modular solution to provide TIS as service is being eliminated

Traffic Information Service (TIS)

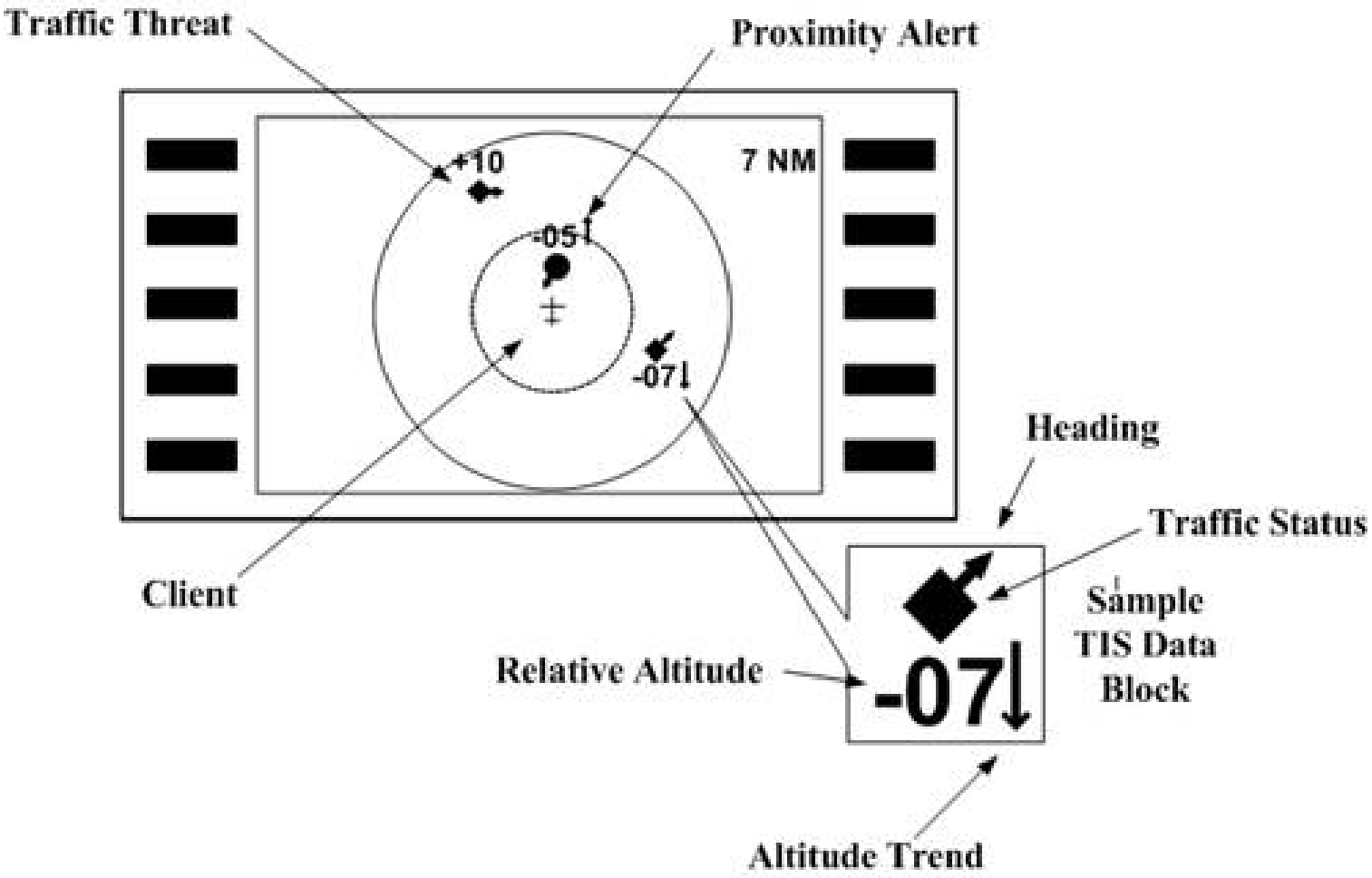
- Advisory service intended to provide situational awareness to pilots
  - LOS from surveillance sensor
- Service includes “intruding” traffic plus “threatening” traffic conditions
  - Equivalent to ACAS Level 1
- Addressed point to point data link
- No cockpit interaction



TIS Uplink Data

- All data is processed and encoded by the surveillance sensor
- Intruder data messages encoded to include:
  - Position relative to requestor
  - Altitude relative to requestor
  - Heading
  - Altitude trend
  - Alerts
- “Keep-alive” messages indicate no traffic
- “Good-bye” messages release aircraft from service

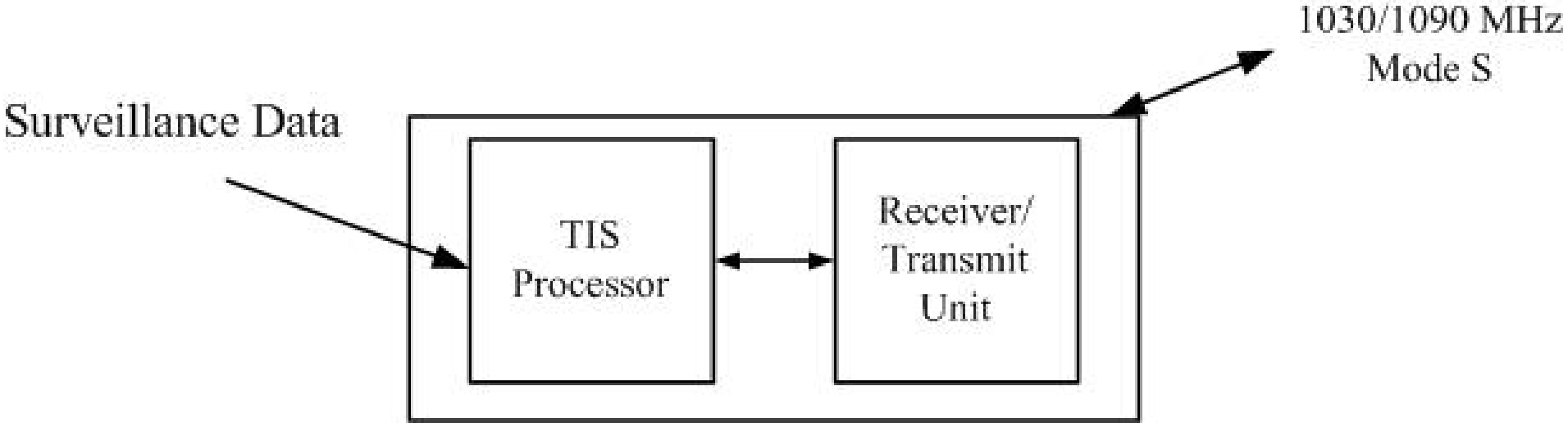
TIS Avionics



TIS Server Concept

- Modular design to work with any secondary surveillance source
  - BI-6
  - ASR-11
  - Wide area multilateration

- TIS Processor plus Mode S Receiver and Transmitter



TIS Server Design Features

- Decouples surveillance and data link functionality
  - Data correlation
- TIS Server is not scan rate limited
  - Refreshing cockpit data faster
- Fusion of multiple surveillance sources
  - Improved boundary service

TIS Server Architecture

- All TIS Server hardware is ASDE-X baseline hardware
  - Maintenance Display Terminal
  - Multi Sensor Data Processor
  - Receiver/Transmitter Unit

- Integrated maintenance display
  - Data recording
  - Diagnostics and monitoring
  - Air Situational Display

- Greater than 60 nmi uplink range
  - 500W transmitter
  - 8 dBi antenna

TIS Server Hardware

Maintenance Display

TIS Processor

Receiver/Transmitter

RF Antenna

TIS Server Processing

- TIS Server interrogates all Mode S Comm-B aircraft for TIS capability
  - Transponder capability
  - Data link channel
- TIS equipped aircraft are correlated to radar tracks
  - Beacon code
  - Altitude
  - Range
- Surrounding traffic is encoded and uplinked to requesting aircraft
  - Sector marks coordinate interrogations with radar

Testing and Evaluation

- TIS Server was evaluated using simulated and live target scenarios
- Radar simulator used to verify conformance with TIS Minimum Operational Performance Standards
- Syracuse Hancock Airport evaluation
  - Comparing ASR-9 to TIS Server

Radar Simulations

- TIS Minimal Operational Performance Standards includes key specifications
  - Mode S Specific Protocol Interface
  - TIS Establishment/Disconnection Protocol
  - Traffic Information Blocks
  - Handling of Multiple TIS Alerts
  - Traffic Status Logic

- Simulations showed TIS Server is compliant with Minimum Operational Performance Standards

- TIS Server successfully completed 18 simulated scenarios used for ASR-9 TIS Operational Test and Evaluation

Syracuse Hancock Airport Evaluation

- TIS Server set up near ASR-9 at Syracuse Hancock Airport
- Server “provides” TIS to all aircraft regardless of capability
  - Increases traffic
  - Transmissions disabled
- Recorded TIS uplinks at ASR-9 and TIS Server

Live Evaluation Results

- More than 80 clients observed on both systems
  - 1000's of TIS uplinks
  - Majority correctly contained no traffic data
  - No predicted collisions on either system
- TIS Server output compared to ASR-9
  - Joint effort between MIT Lincoln Laboratories & Sensis Corp.
- TIS Server was the same as ASR-9 TIS

Conclusion

- Low cost, modular TIS Server can be used with many secondary surveillance sources
- TIS server is 100% compliant with Minimum Operation Performance Standards compliant
- TIS Server is comparable to the TIS currently deployed in the NAS
- TIS Server is a viable replacement for areas losing or requiring service

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Detect the Difference